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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in Flexible Sealing Sleeves for Ball Joints

We, ENGINEERING PRODUCTIONS (CLEVEDON) LIMITED, a British Company, of Clevedon, Somerset, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to flexible sealing sleeves for ball joints of the type having a housing socket with an open mouth through which a ball pin projects from a ball element movably seated in the socket, and is concerned with improving the sealing efficiency of such sleeves.

It has already been proposed in prior British Patent Specification No. 874,566 to provide a ball joint with a flexible sealing sleeve which can be sealed at one end around the housing mouth and incorporates, at the other end, an annular sealing lip adapted to make wiping contact with the ball pin projecting through the housing mouth, or with a member coupled thereto, thereby to form a seal around said pin or member, and a reinforcing element which is disposed internally of said sleeve and adapted to maintain the sealing lip operative, such element also incorporating a surface part adapted to make wiping or rubbing contact with a surface on or carried by the pin or member thereby to provide a second seal within the sleeve.

It has also been proposed in prior British Patent Specification No. 910,969 to provide a ball joint with a flexible sealing sleeve having one open end attachable around the mouth of the joint housing and the other open end defined by an annular sealing lip, with an inner peripheral edge arranged to make wiping contact around the ball pin, or around a part encircling the ball pin, and a rigid annular washer which is secured around the inside of said lip, with

the inner peripheral lip edge overhanging the opening therethrough, said washer being arranged to support the lip and maintain said overhanging lip edge in wiping contact as aforesaid.

The present invention is a development of the aforesaid constructions and accordingly provides, for use in a ball joint of the type specified, a flexible sealing sleeve having one open end arranged to form a seal around the socket mouth, having the opposite open end inwardly shouldered and formed with a flexible inner annular lip, arranged to provide a seal around the ball pin, and with a flexible outer annular lip, arranged to provide a seal against the adjoining face of a boss or other apertured part which engages the ball pin, and having a rigid reinforcing washer which is bonded or otherwise secured around the inside of the sleeve shoulder and has an internal diameter dimensioned so that the opening through the washer is overhung by the aforesaid inner sealing lip. With such an arrangement sealing of the sleeve end remote from the socket mouth, where movement between the sleeve and pin is liable to take place, is effected in two stages while, at the same time, dirt is prevented from becoming trapped between the sealing sleeve and the adjoining face of the boss or apertured part in which the ball pin is engaged as aforesaid.

In order that the invention may be clearly understood and readily carried into effect, a number of embodiments thereof will now be described in detail with reference to the accompanying drawing, in which:—

Figure 1 is a part-sectional side elevation showing one form of flexible sealing sleeve of the invention in operative position on a ball joint,

Figure 2 is a detail cross-sectional view

showing part of an alternative form of sealing sleeve, and

Figure 3 is a view similar to Figure 2 but showing part of a further alternative form of sealing sleeve.

In Figure 1 of the drawings, a flexible sealing sleeve 1 constructed in accordance with the invention is shown applied to a ball joint of generally known form having a housing socket 2 with an open mouth through which a ball pin 3 projects from a ball element movably seated in the socket. The illustrated joint is intended mainly for employment in a vehicle suspension assembly, the housing socket 2 being formed on, or attachable to, one part of the assembly to be jointed, while the projecting ball pin 3 is arranged to engage through an apertured boss 4 or opening in the other part to be jointed. For this purpose, the ball pin 3 may be provided with a screw-threaded extremity for receiving a retaining nut 5. Although a suspension joint has been illustrated by way of example, it will be understood that the invention is equally applicable to various other forms of ball joint including ball joints employed in vehicle steering rod assemblies.

The flexible sealing sleeve 1 is arranged to seal the socket mouth of the joint and, to this end, may have one end opening made somewhat larger than the other, the larger opening being, for example, defined by a neck having an outwardly extending rim flange 1a. This neck may then be arranged to seat around the outside of the socket mouth in a groove formed to receive it, and may be held in the groove by an encompassing circlip 6 or the like. Alternatively, the larger end of the sealing sleeve may be sealed around the socket mouth in any other convenient manner.

At the opposite end, the sealing sleeve is inwardly shouldered and thickened at 1b to form a further neck which defines the smaller end opening, the inner annular surface of this further neck being shaped to form a flexible inner annular lip 1c (see, for example, Figure 2) around the inside of the neck. The diameter of this lip is arranged so as to be smaller than the diameter of the ball pin 3, in the region where the pin projects through the lip, whereby the latter is compressed against the pin periphery, as shown in Figure 1, to provide a seal therearound which maintains firm wiping contact with the pin periphery.

To support the shouldered end 1b of the flexible sleeve, a rigid reinforcing washer 7 is bonded or otherwise secured around the inside of the shoulder, the internal diameter of the washer 7 being such that the opening through the washer is overhung by the aforesaid inner sealing lip

before the latter is compressed around the ball pin. The rigid washer 7, which may be made of metal or other appropriate material, may be partially let into the thickened shoulder part of the sealing sleeve as shown in Figure 1, and may have a flat inner margin which extends around the base of the shoulder, while the outer margin of the washer is arranged to curve into the thickened shoulder material. Alternatively, the washer may have a flat form 7a as shown in Figure 2 and is then conveniently bonded to the inside face of the sleeve shoulder. In yet another alternative shown in Figure 3, the washer 7b is again partially let into the thickened shoulder part of the sealing sleeve and has a flat inner margin which extends around the base of the shoulder, while the outer margin of the washer inclines into the thickness of the material at the shouldered sleeve end. As shown in Figure 3, the form of the inner annular lip 1d around the neck defining the smaller end opening may also be modified.

The washer 7 shown in Figure 1 or the washer 7b shown in Figure 3 may conveniently be moulded into the sleeve during manufacture of the latter. In any of the aforesaid washer forms, the inner margin of the latter may be arranged to seat on a shoulder 8 or other projection provided around the pin 3. In this way the smaller sleeve end is positively located against inward axial movement along the pin towards the socket mouth.

Projecting around the outside of the shoulder 1b at the smaller end of the sleeve is an outwardly flared skirt-like rim 9. This rim is arranged to form a flexible outer annular sealing lip for co-operating with an edge surface of the boss 4 or other part in which the projecting end of the ball pin is arranged to engage. For this purpose the outer sealing lip 9 is dimensioned so that it will be compressed outwardly against the adjoining edge surface of the boss or other apertured part when the ball pin is fully home therein to form a seal around the said surface while, at the same time, locating the smaller sleeve end against outward axial movement along the pin.

By the provision of this further lip 9, all dirt is excluded from the space which is normally formed between the sealing sleeve around the ball pin and the adjoining face of the apertured part in which the ball pin engages. Furthermore, an effective two-stage seal is provided at the small end of the sealing sleeve which gives additional protection against the ingress of any dust or dirt into the housing socket through the mouth thereof irrespective of the movements which are imparted to the ball pin relative to the socket.

An effective two-stage seal of this nature will also provide an improved means of retaining any lubricant present in the joint.

WHAT WE CLAIM IS:—

- 5 1. For use in a ball joint of the type specified, a flexible sealing sleeve having one open end arranged to form a seal around the socket mouth, having the opposite open end inwardly shouldered and  
10 formed with a flexible inner annular lip, arranged to provide a seal around the ball pin, and with a flexible outer annular lip, arranged to provide a seal against the adjoining face of a boss or other apertured  
15 part which engages the ball pin, and having a rigid reinforcing washer which is bonded or otherwise secured around the inside of the sleeve shoulder and has an internal diameter dimensioned so that the opening  
20 through the washer is overhung by the aforesaid inner sealing lip.
2. A flexible sealing sleeve as claimed in claim 1, wherein the lipped sleeve end opening is defined by a neck formed by thickening the inwardly shouldered sleeve end, said  
25 flexible inner annular lip being arranged to project inwardly from the inner surface of the neck.
3. A flexible sealing sleeve as claimed  
30 in claim 2, wherein the inner surface of the sleeve neck is arranged to converge inwardly towards an intermediate apex to form the flexible inner annular sealing lip.
4. A flexible sealing sleeve as claimed  
35 in any of claims 1 to 3, wherein the rigid washer has a flat form and is bonded to the inside face of the sleeve shoulder.
5. A flexible sealing sleeve as claimed in claim 2 or claim 3, wherein the washer  
40 is partially let into the thickened shoulder part of the sealing sleeve and has a flat

inner margin which extends around the base of the shoulder and an outer margin which is inclined or curved into the thickness of the shoulder material.

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6. A flexible sealing sleeve as claimed in any of claims 1 to 5, wherein the flexible outer annular lip is provided by an outwardly flared skirt-like rim which projects around the outside of the shoulder at the  
50 lipped sleeve end.

7. In a ball joint having a ball housing with an open mouth through which a shouldered ball pin projects, a flexible sealing sleeve having one open end attached  
55 around the housing mouth and having the opposite open end supported against axial movement in one direction along the ball pin by a rigid reinforcing washer, which seats against the pin shoulder, and provided  
60 with inner and outer flexible lips the inner of which forms a seal around the ball pin and the outer of which is arranged to form a seal around a surface of a boss or other apertured part, in which the ball pin is  
65 intended to engage, in a manner which locates the lipped sleeve end against axial movement along the ball pin in the opposite direction.

8. The improved sealing sleeve substantially as hereinbefore described and illustrated with reference to any of the Figures of the accompanying drawing.

9. A ball joint having a sealing sleeve substantially as hereinbefore described and  
75 illustrated with reference to any of the Figures of the accompanying drawing.

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